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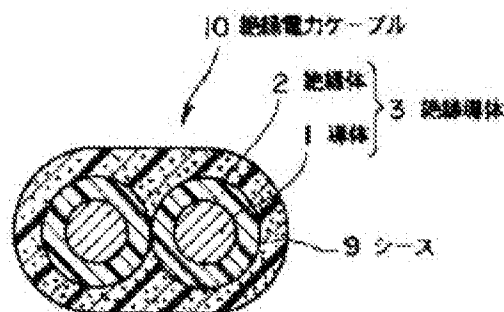
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(54) FLEXIBLE NON-HALOGEN WIRE CABLE

(57)Abstract:

PROBLEM TO BE SOLVED: To improve tearableness and to improve handleability and executability by foaming and forming a non-halogen flame-retarding sheath for covering the surfaces of a pair of insulated conductors each composed by covering a conductor with an insulator formed of a polyvinyl chloride resin or an olefin-based resin, or the surface of a structural body molded by intertwining a plurality of the insulated conductors with one another intervening an inclusion.

SOLUTION: An insulated conductor 3 is composed by covering a conductor 1 formed of a soft copper wire with an insulator 2 formed of a polyvinyl chloride resin or cross-linking polyethylene. An insulated power cable 10 is composed by covering the surfaces of a pair of the insulated conductors 3 with a sheath 9. The sheath 9 is formed of a non-halogen flame-retarding sheath formed by foaming an olefin-based resin. that is, the sheath 9 is formed by mixing at least a flame retarding material and an organic chemical foam material in the olefin-based resin, by additionally mixing a processing assistant agent and an antioxidant as



required, and by foaming them with a foaming rate of 5-20%.

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CLAIMS

[Claim(s)]

[Claim 1]A flexible non halogen electric wire cable which foams in a non halogen fire retardancy sheath which set on a conductor two insulated conductors which cover an insulator which consists of polyvinyl chloride resin or olefin system resin, and also twisted these two or more insulated conductors, intervened, and fabricated doubling inclusion, and also is covered.

[Claim 2]The flexible non halogen electric wire cable according to claim 1 which the above-mentioned non halogen fire retardancy sheath blends fire retardant and the Organic Chemistry Division foaming agent with olefin system resin at least, and blends processing aid and an antioxidant if needed and is made to foam to expansion ratio of 5 to 20%.

[Claim 3]At least, to olefin system resin 100 weight section, the above-mentioned non halogen fire retardancy sheath carries out 0.2-5 weight-section combination of 50 to 200 weight section, and the Organic Chemistry Division foaming agent, and fire retardant. In addition, the flexible non halogen electric wire cable according to claim 1 or 2 which blends a proper quantity of processing aid and antioxidants if needed, and is made to foam to expansion ratio of 5 to 20%.

[Claim 4]The above-mentioned olefin system resin Straight-chain-shape low density polyethylene, low density polyethylene, An ethylene-vinyl acetate copolymer, an ethylene-ethyl acrylate copolymer, An ethylene-methyl methacrylate copolymer, an ethylene acrylic acid copolymer, An ethylene methacrylic acid copolymer, high density polyethylene, polypropylene, The flexible non halogen electric wire cable according to claim 2 or 3 which are any one sort or two sorts or more of mixtures of metallocene system straight-chain-shape low density polyethylene, metallocene ultra low density polyethylene, ethylene propylene rubber, and acrylonitrile butadiene rubber.

[Claim 5]The above-mentioned fire retardant Magnesium hydroxide, aluminium hydroxide, zirconium hydroxide, The flexible non halogen electric wire cable according to claim 2, 3, or 4

which are any one sort or two sorts or more of mixtures of calcium hydroxide, barium hydroxide, zinc borate, zinc metaborate, calcium carbonate, oxidation molybdenum, red phosphorus, phosphoric ester, ammonium polyphosphate, and potassium titanate.

[Claim 6]The flexible non halogen electric wire cable according to claim 2, 3, 4, or 5 where the above-mentioned fire retardant performs coupling processing or a surface treatment by silane coupling agent, a titanate coupling agent, various fatty acid (stearic acid and oleic acid), etc. and which raises dispersibility and dampproofing.

[Claim 7]The above-mentioned Organic Chemistry Division foaming agent AZOJI carvone amide, azobisisobutyronitrile, The flexible non halogen electric wire cable according to claim 2, 3, 4, 5, or 6 which are any one sort or two sorts or more of mixtures of a dinitro pentamethylene tetramine, PARATORU ene sulfonylhydrazide, and 4,4'-oxybis benzene sulfonylhydrazide.

[Claim 8]Combination of the above-mentioned Organic Chemistry Division foaming agent blends fire retardant with olefin system resin, and if needed Processing aid, The flexible non halogen electric wire cable according to claim 2, 3, 4, 5, 6, or 7 which is what is performed by making a masterbatch which blends the Organic Chemistry Division foaming agent with a mixture which blended and formed an antioxidant, and is formed knead.

[Claim 9]At least the above-mentioned non halogen fire retardancy sheath to olefin system resin Fire retardant, The flexible non halogen electric wire cable according to claim 2, 3, 4, 5, 6, 7, or 8 which blend a silane coupling agent, a cross linking agent, a crosslinking catalyst, and the Organic Chemistry Division foaming agent, and it is made to foam to expansion ratio of 5 to 20%, and is made to construct a bridge.

[Claim 10]Combination of the above-mentioned Organic Chemistry Division foaming agent blends fire retardant with olefin system resin, and if needed Processing aid, To a compound which blended and formed an antioxidant, the Organic Chemistry Division foaming agent, a silane coupling agent, The flexible non halogen electric wire cable according to claim 2, 3, 4, 5, 6, 7, 8, or 9 which makes a masterbatch which blends a cross linking agent and a crosslinking catalyst and is formed knead, extrudes and covers, and forms a sheath.

[Claim 11]The above-mentioned silane coupling agent Vinyltrimetoxysilane, vinyltriethoxysilane, The flexible non halogen electric wire cable according to claim 2, 3, 4, 5, 6, 7, 8, 9, or 10 which are any one sort or two sorts or more of mixtures, vinylmethyldiethoxysilane and vinylphenyl dimethoxysilane.

[Claim 12]The above-mentioned cross linking agent A JIKUMIRUPAOKI site, The flexible non halogen electric wire cable according to claim 2, 3, 4, 5, 6, 7, 8, 9, 10, or 11 which are any one sort or two sorts or more of mixtures of 2,5-(third butylperoxy) hexyne-3,1,3-bis(third butylperoxy isopropyl)benzene.

[Claim 13]The flexible non halogen electric wire cable according to claim 2, 3, 4, 5, 6, 7, 8, 9,

10, 11, or 12 whose above-mentioned crosslinking catalyst is dibutyl tin methyl dibutyltin dilaurate, dibutyltin dimaleate, or KAPUCHIDO.

[Claim 14]The flexible non halogen electric wire cable according to claim 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, or 13 whose above-mentioned processing aid is any one sort or two sorts or more of mixtures of poly methyl methacrylate, stearic acid, and polyethylene wax.

[Claim 15]Claims 2, 3, 4 and 5 whose above-mentioned antioxidant is a hinder TOFE Norian system antioxidant or a Thiobis phenolic antioxidant, 6, 7, 8, 9, 10, 11, 12 and 13, or a flexible non halogen electric wire cable given in 14.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention]This invention set two insulated conductors which cover the insulator which consists of olefin system resin, and also. Or twist these two or more insulated conductors, doubling inclusion is made to intervene, it molds, and the non halogen electric wire cable which covers a non halogen fire retardancy sheath as the outermost layer is started, especially pliability is given, and it is related with the flexible non halogen electric wire cable which can improve handling nature and workability.

[0002]

[Description of the Prior Art]A thermoplastic resin composition is excellent in electric nature, and since [that a dielectric constant is small] there is little dielectric loss, it is used for the insulated power cable etc. which are covered and formed on a conductor or an electric insulated wire as an insulator or a sheath. And as a thermoplastic resin composition, withstand voltage and insulation resistance are comparatively high, a production cost is low, and many polyvinyl-chloride-resin constituents (halogenide) are used from before from the place which is independently excellent in fire retardancy. However, if it is in the conventional thermoplastic resin composition using such a polyvinyl-chloride-resin constituent, for example an electric wire and a cable are burned in order to carry out incineration cast-away disposal, the hydrogen chloride gas which has corrosiveness from a polyvinyl-chloride-resin constituent will be emitted. Then, the trial which uses olefine-system-resin-composition things, such as polyethylene, for the insulator and sheath of the electric wire and cable of the part which emits the elevated temperature of the wire harness of a car, interior wiring, etc. as the insulator which does not use a halogenide, or a sheath is made in recent years. This olefine-system-resin-composition thing is mixing metal hydroxide, such as magnesium hydroxide, in order not to have fire retardancy but to give predetermined fire retardancy, if independent.

[0003]Namely, as shown in drawing 3, the two insulated conductors 3 which covered the insulator 2 constituted with polyvinyl chloride resin or cross-linked polyethylene by the conductor 1 which comprises annealed copper wire are aligned with the conventional insulated power cable, There is the insulated power cable 5 (for example, VVF cable) besides constituted by covering the sheath 4 constituted with non halo fire retardancy polyolefine. It is [two or more / (in drawing 4.)] about the insulated conductor 3 which covered the insulator 2 constituted with polyvinyl chloride resin or cross-linked polyethylene by the conductor 1 which comprises annealed copper wire to the conventional insulated power cable as shown in drawing 4. Three are twisted, and the intervention 6 is made to intervene, it fabricates to a round shape, the presser-foot volume tape 7 is twisted, and there is the insulated power cable 8 (for example, VVR cable) constituted by covering the sheath 4 constituted with non halo fire retardancy polyolefine on this. And the non halogen fire retardancy sheath which constitutes the sheath 4 which becomes the outermost layer of this insulated power cable 5 and the insulated power cable 8 is extruded and covered.

[0004]In order in wiring the electric wire and cable with which the non halogen fire retardancy sheath was used for such an outermost layer sheath for those who do wiring to perform multipoint connection of an electric wire and a cable or to connect an electric wire and a cable to a terminal etc., terminal treatment of an electric wire and a cable is performed. In performing this terminal treatment by an electric wiring construction person, the strip of the sheath of an electric wire and a cable is carried out, and the work which exposes an insulated conductor is done. In the exposure work of this insulated conductor, the cutter knife was turned off in the sheath between two insulated conductors so that two insulated conductors might be divided, the sheath was torn apart to the conductor longitudinal direction, and the sheath is exfoliated after an appropriate time. However, when non halogen ghosts, such as olefine-system-resin-composition things, such as polyethylene, are used for the sheath of an electric wire and a cable for such an environmental measure or disaster measures, Since tear load and crookedness load are greatly hard and inferior to pliability as compared with the case where PVC (polyvinyl chloride resin) is used, When exfoliating a sheath and carrying out laying wiring of an electric wire and the cable, it cannot perform easily tearing a sheath or bending an electric wire and a cable, but the handling nature of an electric wire and a cable and workability are getting worse. In the case of the electric wire and cable used for the sheath, a non halogen ghost Then, the former, using olefine resin of a meta-selone catalyst system **** -- EPM (an ethylene propylene copolymer.) the following -- it is the same -- elastomer components, such as NBR (the same [acrylonitrile butadiene rubber and the following]), are used, or a comparatively flexible ethylene-vinyl acetate copolymer (EVA) is used, and pliability is given.

[0005]

[Problem(s) to be Solved by the Invention]However, use olefine resin of a meta-selone catalyst

system for the charge of a sheath material in this way, or. When elastomer components, such as EPM (it is [an ethylene propylene copolymer and the following] the same) and NBR (it is [acrylonitrile butadiene rubber and the following] the same), are used or a comparatively flexible ethylene-vinyl acetate copolymer (EVA) is used, can give pliability to a sheath, but. For example, the cutter knife is turned off between two insulated conductors so that two insulated conductors may be divided, and if a sheath tends to be torn apart to a conductor longitudinal direction and it is going to exfoliate, a sheath will not be torn by the certain direction, but there is a problem that tear nature is extremely bad.

[0006]The purpose of this invention is using as the main ingredients the olefin system resin which does not contain a halogenide, controlling tear load and crookedness load, giving predetermined tear load and predetermined crookedness load, improving tear nature, and enabling it to raise handling nature and workability.

[0007]

[Means for Solving the Problem]To achieve the above objects, the flexible non halogen electric wire cable according to claim 1, It foams in a non halogen fire retardancy sheath which set on a conductor two insulated conductors which cover an insulator which consists of polyvinyl chloride resin or olefin system resin, and also twisted these two or more insulated conductors, intervened, and fabricated doubling inclusion, and also is covered, and it is constituted. When two insulated conductors are set and also it is covered (for example, VVF cable), it twisted two or more insulated conductors (for example, 3), a non halogen fire retardancy sheath intervened, and fabricated doubling inclusion to a round shape, and also may cover it (for example, VVR cable). This non halogen fire retardancy sheath doubled two conductors which extruded and covered an insulator, and also extrudes them, or it twisted three conductors which extruded and covered an insulator, made doubling inclusion intervene, and was fabricated to a round shape, and also is extruded, and is covered. A foaming agent is blended with this non halogen fire retardancy sheath, and a sheath which extruded when extruded and covered, and was covered with covering heat foams in it.

[0008]According to the invention according to claim 1, olefin system resin which does not contain a halogenide is used as the main ingredients by constituting in this way, Tear load and crookedness load can be controlled, predetermined tear load and predetermined crookedness load can be given, tear nature can be improved, and handling nature and workability can be raised.

[0009]To achieve the above objects, the flexible non halogen electric wire cable according to claim 2, Fire retardant and the Organic Chemistry Division foaming agent are blended with olefin system resin for the above-mentioned non halogen fire retardancy sheath at least, and blend processing aid and an antioxidant if needed, and it is made to foam to expansion ratio of 5 to 20%, and constitutes. At 5 to 20%, expansion ratio of a sheath by the Organic Chemistry

Division foaming agent demonstrates the validity, and, ideally, is 7 to 15%. It is because having made expansion ratio of this sheath into 5 to 20% will tear if expansion ratio of a sheath is less than 5%, and improvement in a sex cannot be expected, and is because it will fall more than intensity which tensile strength needs if expansion ratio of a sheath exceeds 20%. Having considered it as 7 to 15% as ideal expansion ratio, It is because the cutter knife is turned off in a sheath, it can tear so that a sheath can be torn easily, as it opens to right and left with an insulated conductor, and a sex can be improved, sufficient tensile strength can be obtained and validity can be demonstrated most.

[0010]According to the invention according to claim 2, olefin system resin which does not contain a halogenide is used as the main ingredients by constituting in this way, Tear load and crookedness load can be controlled, predetermined tear load and predetermined crookedness load can be given, tear nature can be improved, and handling nature and workability can be raised.

[0011]To achieve the above objects, the flexible non halogen electric wire cable according to claim 3, At least, to olefin system resin 100 weight section, carry out 0.2-5 weight-section combination of 50 to 200 weight section, and the Organic Chemistry Division foaming agent for fire retardant, and the above-mentioned non halogen fire retardancy sheath. In addition, blend a proper quantity of processing aid and antioxidants if needed, and it is made to foam to expansion ratio of 5 to 20%, and constitutes. To achieve the above objects the flexible non halogen electric wire cable according to claim 4, The above-mentioned olefin system resin Straight-chain-shape low density polyethylene (LLDPE), Low density polyethylene (LDPE), an ethylene-vinyl acetate copolymer (EVA), An ethylene-ethyl acrylate copolymer (EEA), an ethylene-methyl methacrylate copolymer (EMM), An ethylene acrylic acid copolymer, an ethylene methacrylic acid copolymer, High-density-polyethylene (HDPE) and polypropylene (PP) metallocene system straight-chain-shape low density polyethylene (metallocene system LLPDE), It constitutes from any one sort or two sorts or more of mixtures of metallocene ultra low density polyethylene (metallocene VLDPE), ethylene propylene rubber (EPA), and acrylonitrile butadiene rubber (NBR). To achieve the above objects the flexible non halogen electric wire cable according to claim 5, The above-mentioned fire retardant Magnesium hydroxide, aluminium hydroxide, zirconium hydroxide, It constitutes from any one sort of calcium hydroxide, barium hydroxide, zinc borate, zinc metaborate, calcium carbonate, oxidation molybdenum, red phosphorus, phosphoric ester, ammonium polyphosphate, and potassium titanate, or two sorts or more. To achieve the above objects the flexible non halogen electric wire cable according to claim 6, Coupling processing or a surface treatment according the above-mentioned fire retardant to a silane coupling agent, a titanate coupling agent, various fatty acid (stearic acid and oleic acid), etc. is performed, and dispersibility and dampproofing are raised.

[0012]Fire retardant is for giving fire retardancy to olefin system resin which is base resin of a non halogen fire retardancy sheath, Magnesium hydroxide, aluminium hydroxide, zirconium hydroxide, calcium hydroxide, It comprises any one sort of barium hydroxide, zinc borate, zinc metaborate, calcium carbonate, oxidation molybdenum, red phosphorus, phosphoric ester, ammonium polyphosphate, and potassium titanate, or two sorts or more. Especially metal hydroxide is an inorganic flame retardant used for olefin system resin, and gives a fire-resistant operation to an olefine-system-resin-composition thing, and, as for an olefine-system-resin-composition thing by which heating process shaping was carried out without blending this metal hydroxide with olefin system resin, fire retardancy is not shown at all. As this metal hydroxide, magnesium hydroxide, aluminium hydroxide, calcium hydroxide, etc. are used. When olefin system resin becomes difficult to burn and burns by blending this metal hydroxide with olefin system resin, it has the operation which carbonizes a cinder and gives firmness. The two or more (for example, magnesium hydroxide and aluminium hydroxide) kind choice also of also choosing and blending one kind (for example, magnesium hydroxide) can be made, and it can also blend these metal hydroxide.

[0013]50-200 weight-section combination of such fire retardant is carried out to olefin system resin 100 weight section. Having made loadings of this fire retardant into 50 to 200 weight section to olefin system resin 100 weight section, It is because predetermined fire retardancy cannot be acquired if there are few loadings of fire retardant to olefin system resin 100 weight section than 50 weight sections, It is because abrasion resistance to a mechanical shock will fall if it blends not only exceeding the ability of fire retardancy beyond it not to be acquired but exceeding 200 weight sections even if loadings of fire retardant blend exceeding 200 weight sections to olefin system resin 100 weight section.

[0014]If the Organic Chemistry Division foaming agent is for making olefin system resin which is base resin of a non halogen fire retardancy sheath foam, and the Organic Chemistry Division foaming agent is blended with olefin system resin, and it extrudes and covers with an extruder, With heat when it extrudes, the Organic Chemistry Division foaming agent acts and olefin system resin foams. Expansion ratio which blends this Organic Chemistry Division foaming agent with olefin system resin and to which olefin system resin is made to foam is 5 to 20%, and is 7 to 15% ideally. Having made expansion ratio of olefin system resin by this Organic Chemistry Division foaming agent combination into 5 to 20%, enough, when expansion ratio is less than 5% -- it is because it tears and a sex is not obtained, and is because it tears although it will tear if expansion ratio exceeds 20%, and a sex improves, and load becomes low too much and a predetermined physical characteristic is no longer acquired. Ideal expansion ratio of olefin system resin was made into 7 to 15% because a fall of a physical characteristic will begin to have changed a lot if expansion ratio is 7%, it can tear easily and expansion ratio exceeds 15%.

[0015]0.2-5 weight-section combination of such an Organic Chemistry Division foaming agent is carried out to olefin system resin 100 weight section. Having made loadings of this Organic Chemistry Division foaming agent into 0.2 to 5 weight section to olefin system resin 100 weight section, If loadings of the Organic Chemistry Division foaming agent are less than 0.2 weight sections to olefin system resin 100 weight section, a firing rate of olefin system resin is less than 5%, and enough, if it is because it tears and a sex is not obtained and loadings of the Organic Chemistry Division foaming agent blend exceeding five weight sections to olefin system resin 100 weight section, It is because it tears although it tears in order that a firing rate of olefin system resin may foam exceeding 20%, and a sex improves, and load becomes low too much and a predetermined physical characteristic is no longer acquired.

[0016]According to the invention given in Claims 3, 4, 5 and 6, by constituting in this way. Olefin system resin which does not contain a halogenide is used as the main ingredients, tear load and crookedness load are controlled, predetermined tear load and predetermined crookedness load are given, tear nature can be improved, handling nature and workability can be raised, and fire retardancy made into a standard can be secured.

[0017]To achieve the above objects the flexible non halogen electric wire cable according to claim 7, The Organic Chemistry Division foaming agent blended with the above-mentioned non halogen fire retardancy sheath AZOJI carvone amide, It constitutes from any one sort or two sorts or more of mixtures of azobisisobutyronitrile, a dinitro pentamethylene tetramine, baratol hydrazide, 4, and 4'-oxybis benzene sulfonylhydrazide. AZOJI carvone amide is a foaming agent of olefin system resin with a decomposition temperature of 100 **.

Azobisisobutyronitrile is a foaming agent of olefin system resin with a decomposition temperature of 90-100 **. A dinitro pentamethylene tetramine is a sponging agent with a decomposition temperature of 200 **. PARATORU ene sulfonylhydrazide is a foaming agent of olefin system resin with a decomposition temperature of 110 ** further again. And 4 and 4'-oxybis benzene sulfonylhydrazide are the foaming agents of olefin system resin with a decomposition temperature of 140-160 **, and serve as a foaming agent and cross linking agent to a resin-rubber blend. The two or more (for example, AZOJI carvone amide and azobisisobutyronitrile) kind choice also of also choosing and blending one kind (for example, AZOJI carvone amide) can be made, and it can also blend these foaming agents. Thus, since each decomposition temperature (foaming temperature) of a foaming agent differs when two kinds of foaming agents are mixed and blended, it becomes possible by using a foaming agent properly and adjusting cooking temperature to adjust foaming time freely.

[0018]According to the invention according to claim 7, foaming time of olefin system resin which is base resin of a non halogen fire retardancy sheath can be freely adjusted by constituting in this way by choosing the Organic Chemistry Division foaming agent blended with a non halogen fire retardancy sheath.

[0019]To achieve the above objects further again the flexible non halogen electric wire cable according to claim 8, It is made to carry out by making a masterbatch which blends the Organic Chemistry Division foaming agent with a mixture which fire retardant was blended with olefin system resin for combination of the Organic Chemistry Division foaming agent blended with the above-mentioned non halogen fire retardancy sheath, and blended and formed processing aid and an antioxidant if needed, and is formed knead. A combination method of the Organic Chemistry Division foaming agent blended with a non halogen fire retardancy sheath covered by the outermost layer of an electric wire cable, There are a method of adding Organic Chemistry Division foam as it is and a method of adding by making a masterbatch beforehand blended and formed [specified quantity / (for example, 0.2 to foam active principle 5 weight section)] in olefin system resin in the Organic Chemistry Division foaming agent knead. Fire retardant, processing aid, and an antioxidant may be blended with this masterbatch.

[0020]In order to acquire pliability, when making it soft using a rubber additive or a metallocene catalyst, it is necessary to all consider one combination [one] for every product to manufacture, and the adjustment is dramatically troublesome, but. Since a masterbatch of specific expansion ratio (for example, 10%) is made beforehand according to the invention according to claim 8, even if it is a product in which expansion ratio differs, by using this masterbatch. It can tear freely by controlling an addition of a masterbatch, and a sex can be adjusted, by the change in an addition of a masterbatch, foaming efficiency can be changed freely, a constant level can tear, a sex and pliability can be acquired, tear nature can be improved, and handling nature and workability can be raised.

[0021]To achieve the above objects the flexible non halogen electric wire cable according to claim 9, Blend fire retardant, a silane coupling agent, a cross linking agent, a crosslinking catalyst, and the Organic Chemistry Division foaming agent with olefin system resin, and expansion ratio of 5 to 20% is made to foam to it at least, and a bridge is constructed and the above-mentioned non halogen fire retardancy sheath is constituted. To achieve the above objects the flexible non halogen electric wire cable according to claim 10, Blend fire retardant with olefin system resin, and combination of the above-mentioned Organic Chemistry Division foaming agent if needed Processing aid, A masterbatch which blends the Organic Chemistry Division foaming agent, a silane coupling agent, a cross linking agent, and a crosslinking catalyst with a compound which blended and formed an antioxidant, and is formed is made to knead, it extrudes and covers, and a sheath is formed and constituted. To achieve the above objects the flexible non halogen electric wire cable according to claim 11, The above-mentioned silane coupling agent consists of any one sort or two sorts or more of mixtures of vinyltrimetoxysilane (VTMS), vinyltriethoxysilane, vinylmethyldiethoxysilane, and vinylphenyl dimethoxysilane. To achieve the above objects the flexible non halogen electric wire cable

according to claim 12, The above-mentioned cross linking agent consists of any one sort or two sorts or more of mixtures, a JIKUMIRUPAOKI site (DCP) and 2,5-(third butylperoxy) hexyne-3,1,3-bis(third butylperoxy isopropyl)benzene. The flexible non halogen electric wire cable according to claim 13 constitutes the above-mentioned crosslinking catalyst from dibutyl tin methyl dibutyltin dilaurate, dibutyltin dimaleate, or KAPUCHIDO to achieve the above objects.

[0022]a coupling agent is a chemical which can react to both reinforcement and resin base materials of a composite material, and can form a strong combination in an interface, or can promote it, and is ***** about between molecules of olefin system resin. And there are vinyltrimetoxysilane, vinyltriethoxysilane, BINIRUTORI butoxysilane, normal hexyl trimethoxysilane, etc. in a silane coupling agent. Various silane coupling agents, such as these vinyltrimetoxysilane, vinyltriethoxysilane, BINIRUTORI butoxysilane, and normal hexyl trimethoxysilane, Blending only one kind (for example, vinyltrimetoxysilane) can also blend beyond two kind (for example, vinyltrimetoxysilane and vinyltriethoxysilane).

[0023]A thing for making it start by such a coupling agent to carry out the bridging of between molecules of olefin system resin is a cross linking agent. Chemicals bridge construction by this cross linking agent is what constructs a bridge by blending and heating cross linking agents, such as dicumyl peroxide (DCP), If olefin system resin which blended a cross linking agent is heated, first, by heating, a cross linking agent decomposes, a free radical is made, polymer will react to this free radical, polymer will be activated, a polymeric release group will be generated, these polymeric release groups will join together, and polymer bridge construction will be formed. It is foamed in a sheath extruded and covered on an insulator by it at the same time extrusion covering is carried out by heat at the time of extruding and covering, and immediately after foaming, crosslinking reaction occurs and a bridge is constructed over it by existence of moisture in the air. Water bridge construction by vinylsilane to olefin system resin which is polymer. It is carried out by blending and heating SHIRANO condensation catalysts (siloxane condensation catalyst) which are uncombined radical generating agents (cross linking agent), such as silane compounds (coupling agent), such as dicumyl peroxide (DCP) and vinyltrimetoxysilane (VTMS), and dibutyltin dilaurate. That is, if polymer (olefin system resin), a cross linking agent (dicumyl peroxide), a silane compound (vinyltrimetoxysilane), and a SHIRANO condensation catalyst (dibutyltin dilaurate) are blended and heat is applied from the exterior, a cross linking agent will be decomposed and a free radical will be made. Polymer reacts to this free radical, polymer is activated, a polymeric release group is generated, this polymeric release group and silane compound (vinyltrimetoxysilane) react, and graph Tomah is generated. And a catalyst (dibutyltin dilaurate) of a tin system acts on this graph Tomah, and by existence of water, vinyl of vinyltrimetoxysilane of a silane coupling agent can be taken to a free radical however, and it combines with it. Namely, a chain is built after Si (Silang) has gone

into a polymer (olefin system resin) molecule, The same phenomenon also as another polymer (olefin system resin) molecule occurs, and two polymer (olefin system resin) molecules, Crosslinking reaction (Silang bridge construction) is performed in a form which made Si (Silang) midium and made oxygen (O) middle, two polymer (olefin system resin) molecules are connected, and a bridging state is formed.

[0024]A crosslinking catalyst is for promoting bridge formation which makes a coupling agent intervene between molecules of olefin system resin, and there are dibutyltin dilaurate, dibutyltin diacetate, dibutyl tin JIOKUTAETO, etc. as this crosslinking catalyst.

[0025]According to the invention given in Claims 9, 10, 11 and 12 and 13, by constituting in this way. Olefin system resin which does not contain a halogenide is used as the main ingredients, tear load and crookedness load are controlled, predetermined tear load and predetermined crookedness load are given, tear nature can be improved, handling nature and workability can be raised, and fire retardancy made into a standard can be secured.

[0026]The flexible non halogen electric wire cable according to claim 14 constitutes the above-mentioned processing aid from any one sort or two sorts or more of mixtures of poly methyl methacrylate, stearic acid, and polyethylene wax to achieve the above objects. According to the invention according to claim 14, a non halogen fire retardancy sheath is easily processible by constituting in this way.

[0027]The flexible non halogen electric wire cable according to claim 15 constitutes the above-mentioned antioxidant from a hinder TOFE Norian system antioxidant or a Thiobis phenolic antioxidant to achieve the above objects. Since an antioxidant is blended with olefin system resin and it constitutes according to the invention according to claim 15 by constituting in this way, a non halogen fire retardancy sheath can be prevented from deteriorating temporally.

[0028]

[Embodiment of the Invention]Hereafter, the embodiment of the paint concerning this invention is described. The 1 embodiment of the flexible non halogen electric wire cable concerning this invention is shown in drawing 1. In drawing 1, 1 is a conductor constituted with annealed copper wire, on this conductor 1, the insulator 2 constituted with polyvinyl chloride resin or cross-linked polyethylene is covered, and the insulated conductor 3 is constituted. Two of this insulated conductor 3 are doubled, on this, the sheath 9 is covered and the insulated power cable 10 (for example, VVF cable) is constituted. This sheath 9 comprises a non halogen fire retardancy sheath in which olefin system resin was made to foam. That is, fire retardant and the Organic Chemistry Division foaming agent are blended with olefin system resin at least, and this sheath 9 blends processing aid and an antioxidant if needed, is made to foam to the expansion ratio of 5 to 20%, and is constituted. The non halogen fire retardancy sheath which constitutes this sheath 9 may blend a silane coupling agent, a cross linking agent, and a crosslinking catalyst, and may construct for them a bridge and constitute them.

[0029]Other embodiments of the flexible non halogen electric wire cable concerning this invention are shown in drawing 2. In drawing 2, 1 is a conductor constituted with annealed copper wire, on this conductor 1, the insulator 2 constituted with polyvinyl chloride resin or cross-linked polyethylene is covered, and the insulated conductor 3 is constituted. Two or more [of this insulated conductor 3] (drawing 2 3) are twisted, and the intervention 6 is made to intervene, it fabricates to a round shape, and the presser-foot volume tape 7 is twisted, on this presser-foot volume tape 7, the sheath 9 is covered and the insulated power cable 11 (for example, VVR cable) is constituted. This sheath 9 comprises a non halogen fire retardancy sheath in which olefin system resin was made to foam. That is, fire retardant and the Organic Chemistry Division foaming agent are blended with olefin system resin at least, and this sheath 9 blends processing aid and an antioxidant if needed, is made to foam to the expansion ratio of 5 to 20%, and is constituted. The non halogen fire retardancy sheath which constitutes this sheath 9 may blend a silane coupling agent, a cross linking agent, and a crosslinking catalyst, and may construct for them a bridge and constitute them.

[0030]

[Example]Concrete working example of the non halogen fire retardancy sheath which constitutes the sheath of the flexible non halogen electric wire cable concerning this invention hereafter is described as compared with a conventional example.

[0031]Working example 1 working example 1 is straight-chain-shape low density polyethylene (on LLDPE and a concrete target.). They are 70 % of the weight and an ethylene-ethyl acrylate copolymer (on EEA and a concrete target.) about NUCG5651 by Nippon Unicar, Inc. 100 weight sections and foaming agent NO1 [one-weight section] (AZOJI carvone amide) are blended [Nippon Unicar, Inc. make NUC-6070] for magnesium hydroxide (specifically Kuisma PH by harmony chemicals incorporated company) to 30% of the weight of mixed base resin 100 weight section.

[0032]Working example 2 working example 2 is an ethylene-ethyl acrylate copolymer (on EEA and a concrete target.). 100 weight sections and foaming agent NO1 [three-weight section] (AZOJI carvone amide) are blended [Nippon Unicar, Inc. make NUC-6070] for magnesium hydroxide (specifically Kuisma PH by harmony chemicals incorporated company) to 100 weight sections.

[0033]Working example 3 working example 3 is straight-chain-shape low density polyethylene (on LLDPE and a concrete target.). They are 40 % of the weight and metallocene system straight-chain-shape low density polyethylene (on the metallocene system LLPDE and a concrete target.) about NUCG5651 by Nippon Unicar, Inc. DEYUPON Dow elastomer EG-8440 to 60% of the weight of mixed base resin 100 weight section Magnesium hydroxide. 0.2 weight sections and foaming agent NO2 [0.2-weight section] (azobisisobutyronitrile) are blended [harmony chemicals incorporated company make Kuisma PH)] with (concrete target

for 120 weight sections and foaming agent NO1 (AZOJI carvone amide).

[0034]Working example 4 working example 4 is straight-chain-shape low density polyethylene (on LLDPE and a concrete target.). They are 50 % of the weight and an ethylene-ethyl acrylate copolymer (on EEA and a concrete target.) about NUCG5651 by Nippon Unicar, Inc. 80 weight sections and foaming agent NO1 [0.5-weight section] (AZOJI carvone amide) are blended [Nippon Unicar, Inc. make NUC-6070] for aluminium hydroxide (being concrete and HAIJI light 421) to 50% of the weight of mixed base resin 100 weight section.

[0035]Working example 5 working example 5 is an ethylene-ethyl acrylate copolymer (on EEA and a concrete target.). They are 90 % of the weight and polypropylene (on PP and a concrete target.) about Nippon Unicar, Inc. make NUC-6070. 50 weight sections and foaming agent NO1 [five-weight section] (AZOJI carvone amide) are blended [product / made from JPO, Inc. / J630G] for magnesium hydroxide (specifically Kuisma PH by harmony chemicals incorporated company) to 10% of the weight of mixed base resin 100 weight section.

[0036]Working example 6 working example 6 is an ethylene-vinyl acetate copolymer (on EVA and a concrete target.). They are 40 % of the weight and metallocene system straight-chain-shape low density polyethylene (on the metallocene system LLPDE and a concrete target.) about Nippon Unicar, Inc. make NUC-3185. DEYUPON Dow elastomer EG-8440 to 60% of the weight of mixed base resin 100 weight section Magnesium hydroxide. In (concrete target, they are 120 weight sections and a silane coupling agent (on vinyltrimetoxysilane (VTMS) and a concrete target.) about harmony chemicals incorporated company make Kuisma PH). They are the amount part of duplexs, and a cross linking agent (on a JIKUMIRUPAOKI site (DCP) and a concrete target.) about Dow Corning Toray Silicone SZ6300. They are 0.1 weight sections and a catalyst (on dibutyltin dilaurate and a concrete target.) about Mitsui DCP by Mitsui petrochemical incorporated company. 0.1 weight sections are blended for Asahi Denka Kogyo K.K. make BT-11, and one weight section and foaming agent NO1 [0.2-weight section] (AZOJI carvone amide) are blended for processing aid (poly methyl methacrylate (PMMA), specifically L-by Mitsubishi Rayon Co., Ltd. 1000).

[0037]Working example 7 working example 7 is an ethylene-ethyl acrylate copolymer (on EEA and a concrete target.). To Nippon Unicar, Inc. make NUC-6070 100 weight section magnesium hydroxide. In (concrete target, they are 200 weight sections and a silane coupling agent (on vinyltrimetoxysilane (VTMS) and a concrete target.) about harmony chemicals incorporated company make Kuisma PH). They are three weight sections and a cross linking agent (on a JIKUMIRUPAOKI site (DCP) and a concrete target.) about Dow Corning Toray Silicone SZ6300. They are 0.2 weight sections and a catalyst (on dibutyltin dilaurate and a concrete target.) about Mitsui DCP by Mitsui petrochemical incorporated company. They are 0.2 weight sections and processing aid (on poly methyl methacrylate (PMMA) and a concrete target.) about Asahi Denka Kogyo K.K. make BT-11. 0.1 weight sections and foaming agent

NO2 [0.1-weight section] (azobisisobutyronitrile) are blended [Mitsubishi Rayon Co., Ltd. make L-1000] for five weight sections and foaming agent NO1 (AZOJI carvone amide).

[0038]The conventional example 1 conventional example 1 is straight-chain-shape low density polyethylene (on LLDPE and a concrete target.). They are 70 % of the weight and an ethylene-ethyl acrylate copolymer (on EEA and a concrete target.) about NUCG5651 by Nippon Unicar, Inc. 100 weight sections of magnesium hydroxide (specifically Kuisma PH by harmony chemicals incorporated company) is blended for Nippon Unicar, Inc. make NUC-6070 to 30% of the weight of mixed base resin 100 weight section.

[0039]The conventional example 2 conventional example 2 blends 100 weight sections of magnesium hydroxide (specifically Kuisma PH by harmony chemicals incorporated company) for an ethylene-ethyl acrylate copolymer (EEA, specifically NUC-by Nippon Unicar, Inc. 6070) to 100 weight sections.

[0040]The conventional example 3 conventional example 3 is an ethylene-vinyl acetate copolymer (on EVA and a concrete target.). They are 40 % of the weight and metallocene system straight-chain-shape low density polyethylene (on the metallocene system LLPDE and a concrete target.) about Nippon Unicar, Inc. make NUC-3185. 120 weight sections of magnesium hydroxide (specifically Kuisma PH by harmony chemicals incorporated company) is blended for DEYUPON Dow elastomer EG-8440 to 60% of the weight of mixed base resin 100 weight section.

[0041]The conventional example 4 conventional example 4 is straight-chain-shape low density polyethylene (on LLDPE and a concrete target.). They are 50 % of the weight and an ethylene-ethyl acrylate copolymer (on EEA and a concrete target.) about NUCG5651 by Nippon Unicar, Inc. They are 20 % of the weight and ethylene propylene rubber (on EPM and a concrete target.) about Nippon Unicar, Inc. make NUC-6070. 80 weight sections of aluminium hydroxide (being concrete and HAIJI light 421) is blended for product [made from JSR, Inc.] EP-02P to 30% of the weight of mixed base resin 100 weight section.

[0042]The conventional example 5 conventional example 5 is an ethylene-ethyl acrylate copolymer (on EEA and a concrete target.). They are 90 % of the weight and polypropylene (on PP and a concrete target.) about Nippon Unicar, Inc. make NUC-6070. 50 weight sections of magnesium hydroxide (specifically Kuisma PH by harmony chemicals incorporated company) is blended for product [made from JPO, Inc.] J630G to 10% of the weight of mixed base resin 100 weight section.

[0043]The conventional example 6 conventional example 6 is an ethylene-vinyl acetate copolymer (on EVA and a concrete target.). They are 40 % of the weight and metallocene system straight-chain-shape low density polyethylene (on the metallocene system LLPDE and a concrete target.) about Nippon Unicar, Inc. make NUC-3185. DEYUPON Dow elastomer EG-8440 to 60% of the weight of mixed base resin 100 weight section Magnesium hydroxide. In

(concrete target, they are 120 weight sections and a silane coupling agent (on vinyltrimetoxysilane (VTMS) and a concrete target.) about harmony chemicals incorporated company make Kuisma PH). They are the amount part of duplexs, and a cross linking agent (on a JIKUMIRUPAOKI site (DCP) and a concrete target.) about Dow Corning Toray Silicone SZ6300. They are 0.1 weight sections and a catalyst (on dibutyltin dilaurate and a concrete target.) about Mitsui DCP by Mitsui petrochemical incorporated company. 0.1 weight sections and one weight section of processing aid (poly methyl methacrylate (PMMA), specifically L-by Mitsubishi Rayon Co., Ltd. 1000) are blended for Asahi Denka Kogyo K.K. make BT-11.

[0044]The conventional example 7 conventional example 7 is an ethylene-ethyl acrylate copolymer (on EEA and a concrete target.). To Nippon Unicar, Inc. make NUC-6070 100 weight section magnesium hydroxide. In (concrete target, they are 200 weight sections and a silane coupling agent (on vinyltrimetoxysilane (VTMS) and a concrete target.) about harmony chemicals incorporated company make Kuisma PH). They are three weight sections and a cross linking agent (on a JIKUMIRUPAOKI site (DCP) and a concrete target.) about Dow Corning Toray Silicone SZ6300. They are 0.2 weight sections and a catalyst (on dibutyltin dilaurate and a concrete target.) about Mitsui DCP by Mitsui petrochemical incorporated company. 0.2 weight sections and five weight sections of processing aid (poly methyl methacrylate (PMMA), specifically L-by Mitsubishi Rayon Co., Ltd. 1000) are blended for Asahi Denka Kogyo K.K. make BT-11.

[0045]Each presentation compound based on these working example 1 - working example 7 was supplied to the extrusion machine with a cylinder diameter of 20 mm, and the sample was created according to the shape of string about 30 mm wide by 1-mm thickness.

[0046]About this sample, hardness was further measured in tearing strength (N) using the JISA hardness meter of JIS-K6301 by the tear resistance examination based on [by the tensile test based on JIS-C3005] JIS-K6301 for tensile strength (MPa). The comparison result is shown in Table 1 and Table 2.

			実 施 例						
			1	2	3	4	5	6	7
組 成 分	ベース樹脂 (重量部)		100	100	100	100	100	100	100
	重量比 (重量%)	LLDPE	70	—	40	50	—	—	—
		E EA	30	100	—	50	90	—	100
		E VA	—	—	—	—	—	40	—
		P P	—	—	—	—	10	—	—
		メタロセン系 LLDPE	—	—	60	—	—	60	—
		P E M	—	—	—	—	—	—	—
	水酸化マグネシウム (重量部)		100	100	120	—	50	120	200
	水酸化アルミニウム (重量部)		—	—	—	80	—	—	—
	シランカップリング剤 (重量部)		—	—	—	—	—	2	3
	架 橋 剤 (重量部)		—	—	—	—	—	0.1	0.2
	触 媒 (重量部)		—	—	—	—	—	0.1	0.2
	加 工 助 剤 (重量部)		—	—	—	—	—	1	5
	発 泡 剤 No 1		1	3	0.2	0.5	5	0.2	0.1
	発 泡 剤 No 2		—	—	0.2	—	—	—	0.1
特 性	目 標 値								
	引張強度 (MPa)	10以上	12	12	11	15	11	11	11
	引裂強度 (N)	70以下	63	45	53	48	44	55	56
	硬 度	A90以下	87	87	87	89	85	87	89
	発 泡 率 (%)		12	20	7	9	18	6	5
判 定 結 果			○	○	○	○	○	○	○

LLDPE：直鎖状低密度ポリエチレン，NUCG5651（日本ユニカー株式会社）

E EA：エチレン-エチルアクリレート共重合体，NUC-6070（日本ユニカー株式会社）

E VA：エチレン酢酸ビニル共重合体，NUC-3185（日本ユニカー株式会社）

P P：ポリプロピレン，J630G（JPO株式会社）

メタロセン系 LLDPE：メタロセン系直鎖状低密度ポリエチレン，EG-8440

（デュポンダウエラストマー）

E PM：エチレン-プロピレン共重合体，EP-02P（JSR株式会社）

水酸化マグネシウム：キスマPH（協和化学株式会社）

水酸化アルミニウム：ハイジライト421

シランカップリング剤：ビニルトリメトキシシラン（VTMS），SZ6300

（東レダウコーニングシリコン）

架橋剤：ジクミルパーオキシサイド，三井DCP（三井石油化学株式会社製）

触媒：ジブチル錫ジラウレート，BT-11（旭電化工業株式会社）

加工助剤：ポリメタクリル酸メチル（PMMA），L-1000（三菱レイヨン株式会社）

発泡剤No 1：アゾジカルボンアミド

発泡剤No 2：アゾビスイソブチロニトリル

[0047]Table 1

			従 来 例						
			1	2	3	4	5	6	7
組成成分	ベース樹脂 (重量部)		100	100	100	100	100	100	100
	重量比 (重量%)	LLDPE	70	—	—	50	—	—	—
		EAA	30	100	—	20	90	—	100
		EVA	—	—	40	—	—	40	—
		PP	—	—	—	—	10	—	—
		メタノ LLDPE	—	—	60	—	—	60	—
		PEM	—	—	—	30	—	—	—
	水酸化マグネシウム (重量部)		100	100	120	—	50	120	200
	水酸化アルミニウム (重量部)		—	—	—	80	—	—	—
	シランカップリング剤 (重量部)		—	—	—	—	—	2	3
	架橋剤 (重量部)		—	—	—	—	—	0.1	0.2
	触媒 (重量部)		—	—	—	—	—	0.1	0.2
	加工助剤 (重量部)		—	—	—	—	—	1	5
	発泡剤 No 1		—	—	—	—	—	—	—
	発泡剤 No 2		—	—	—	—	—	—	—
特性	目 標 値								
	引張強度 (MPa)	10以上	15	16	8	7	18	13	12
	引裂強度 (N)	70以下	125	118	55	60	153	98	93
	硬 度	A90以下	98	97	88	94	96	93	99
	発 泡 率 (%)		0	0	0	0	0	0	0
	判 定 結 果		×	×	×	×	×	×	×

LLDPE：直鎖状低密度ポリエチレン，NUCG5651（日本ユニカー株式会社）

EAA：エチレン－エチルアクリレート共重合体，NUC－6070（日本ユニカー株式会社）

EVA：エチレン酢酸ビニル共重合体，NUC－3185（日本ユニカー株式会社）

PP：ポリプロピレン，J630G（JPO株式会社）

メタノ LLDPE：メタロセン系直鎖状低密度ポリエチレン，EG－8440
（デュポンダウエラストマー）

EPM：エチレン－プロピレン共重合体，EP－02P（JSR株式会社）

水酸化マグネシウム：キスマPH（協和化学株式会社）

水酸化アルミニウム：ハイジライト421

シランカップリング剤：ビニルトリメトキシシラン（VTMS），SZ6300
（東レダウコーニングシリコン）

架橋剤：ジクミルパーオキシサイド，三井DCP（三井石油化学株式会社製）

触媒：ジブチル錫ジラウレート，BT－11（旭電化工業株式会社）

加工助剤：ポリメタクリル酸メチル（PMMA），L－1000（三菱レイヨン株式会社）

発泡剤No 1：アゾジカルボンアミド

発泡剤No 2：アゾビスイソプロクロニトリル

Table 2

Based on the tensile test based on JIS-C3005 provided in Japanese Industrial Standard, measurement of the tensile strength (MPa) in this table 1 and Table 2, Based on the tear resistance examination based on JIS-K6301 which provides measurement of tearing strength (N) in Japanese Industrial Standard, measurement of hardness is performed using the JISA hardness meter of JIS-K6301 provided in Japanese Industrial Standard, respectively.

[0048]it is what showed whether the tensile strength (MPa) in Table 1 and Table 2 could be

lengthened when it pulls by what load (MPa), and is what is evaluated for the purpose of having fixed intensity -- "10 or more MPa" -- it aims at a certain thing. It is what tearing strength (N) tore the string-like sample right and left, and was shown according to load (N), i.e., the maximum sleeper ***** of per the cross-section area (mm^2) of a specimen, when [this] torn, It evaluates for the purpose of the ability to do the **** work at the time of construction easily by human power, and aims at being "less than 70N" which is a numerical value which can be torn comparatively simply. Hardness makes it good to have the pliability (hardness 90) of the general-purpose PVC sheath average, and aims at the value of the JISA hardness meter of JIS-K6301 provided in Japanese Industrial Standard being "less than A90."

[0049]With the Organic Chemistry Division foaming agent, working example 1 - working example 5 which are shown in Table 1 are the foaming thing the olefin system resin which blended fire retardant (metal hydroxide), and working example 6 - working example 7, The Organic Chemistry Division foaming agent is made to blend and foam to the olefin system resin which blended fire retardant (metal hydroxide), and a bridge is made to construct. On the other hand, the conventional example 1 - the conventional example 5 which are shown in Table 2 are what blended fire retardant (metal hydroxide) with olefin system resin, and the conventional example 6 - the conventional example 7 make the olefin system resin which blended fire retardant (metal hydroxide) construct a bridge.

[0050]Next, the tensile test based on JIS-C3005 performed based on each composition component of working example 1-7 and the conventional examples 1-7 shown in Table 1 and Table 2, Each test result of the tear resistance examination based on JIS-K6301 and the hardness further measured using the JISA hardness meter of JIS-K6301 provided in Japanese Industrial Standard is examined.

[0051]Since each composition component of working example 1-7 is approximated with each composition component of the conventional examples 1-7, it makes working example 1-7 and the conventional examples 1-7 correspond to 1 to 1, and examines each test result.

[0052]As opposed to base resin 100 weight section with which both working example 1 and the conventional example 1 mixed the ethylene-ethyl acrylate copolymer (EEA) for straight-chain-shape low density polyethylene (LLDPE) at 30% of the weight of a rate 70% of the weight, It is what blended 100 weight sections of magnesium hydroxide, and working example 1 blends foaming agent NO1 [one-weight section] (AZOJI carvone amide) with olefin system resin containing magnesium hydroxide, and 12% of expansion ratio is made, as for the conventional example 1, to foam in it to remaining as it is. If this working example 1 and conventional example 1 are compared, tensile strength will have attained "10 or more MPa" which is a desired value of ***** to which the tensile strength of working example 1 falls rather than 12MPa and the conventional example 1 to the tensile strength of the conventional example 1 being 15MPa. The tearing strength (N) which shows the load required when tearing a string-

like sample right and left, The desired value "less than 70N" of the tearing strength which is a numerical value with it can be attained, and tear property can be improved. [able for the tearing strength of working example 1 to reduce 63N and tearing strength, and to tear them comparatively simply to the thing whose 125N and tear property of the tearing strength of the conventional example 1 are bad,] As for hardness, the hardness of working example 1 has the pliability (hardness 90) of A87 and the general-purpose PVC sheath average to not having the pliability of the PVC sheath average with as general-purpose hardness of the conventional example 1 as A98. Putting together above, the conventional example 1 has bad tear property, brings the result that it is harder than a general-purpose PVC sheath, and has brought a result which cannot attain a desired value at two points, tearing strength and hardness.

Evaluation is "x."

On the other hand, working example 1 is provided with sufficient tensile strength, its tear property is good, it results in having the pliability of a general-purpose PVC sheath EQC, has brought a result which can fully attain an aim at two points, tearing strength and hardness, and has become "O" as evaluation. In spite of having blended tales doses of homogeneous **** agents with tales doses of homogeneous olefine resin so that clearly from comparison of the composition component of working example 1 and the conventional example 1, It turns out that it is what is depended on that working example 1 was able to secure predetermined hardness and improvement in tear property was able to be aimed at having made olefin system resin containing magnesium hydroxide foam.

[0053]Working example 2 and the conventional example 2 are what both blended 100 weight sections of magnesium hydroxide for the ethylene-ethyl acrylate copolymer (EEA) to 100 weight sections, The conventional example 2 blends foaming agent NO1 [three-weight section] (AZOJI carvone amide) with olefin system resin containing magnesium hydroxide, and makes working example 2 foam to 20% of expansion ratio to remaining as it is. If this working example 2 and conventional example 2 are compared, tensile strength will have attained "10 or more MPa" which is a desired value of ***** to which the tensile strength of working example 2 falls rather than 12MPa and the conventional example 2 to the tensile strength of the conventional example 2 being 16MPa. The tearing strength (N) which shows the load required when tearing a string-like sample right and left, The desired value "less than 70N" of the tearing strength which is a numerical value with it can be attained, and tear property can be improved by leaps and bounds. [able for the tearing strength of working example 2 to reduce 45N and tearing strength, and to tear them comparatively simply to the thing whose 118N and tear property of the tearing strength of the conventional example 2 are bad,] As for hardness, the hardness of working example 2 has the pliability (hardness 90) of A87 and the general-purpose PVC sheath average to not having the pliability of the PVC sheath average with as general-purpose hardness of the conventional example 2 as A97.

Putting together above, the conventional example 2 has bad tear property, brings the result that it is harder than a general-purpose PVC sheath, and has brought a result which cannot attain a desired value at two points, tearing strength and hardness.

Evaluation is "x."

On the other hand, working example 2 is provided with sufficient tensile strength, its tear property is good, it results in having the pliability of a general-purpose PVC sheath EQC, has brought a result which can fully attain an aim at two points, tearing strength and hardness, and has become "O" as evaluation. In spite of having blended tales doses of homogeneous **** agents with tales doses of homogeneous olefine resin so that clearly from comparison of the composition component of working example 2 and the conventional example 2, It turns out that it is what is depended on that working example 2 was able to secure predetermined hardness and improvement in tear property was able to be aimed at having made olefin system resin containing magnesium hydroxide foam.

[0054]When working example 3 is compared with the conventional example 3, working example 3, As opposed to base resin 100 weight section which mixed metallocene system straight-chain-shape low density polyethylene (metallocene system LLPDE) for straight-chain-shape low density polyethylene (LLDPE) at 60% of the weight of a rate 40% of the weight, Foaming agent NO1 (AZOJI carvone amide) and foaming agent NO2 [0.2-weight section] (azobisisobutyronitrile) are blended with each thing which blended 120 weight sections of magnesium hydroxide, respectively, and it is made to foam to 7% of expansion ratio. The conventional example 3 blends 120 weight sections of magnesium hydroxide to base resin 100 weight section which mixed metallocene system straight-chain-shape low density polyethylene (metallocene system LLPDE) for the ethylene-vinyl acetate copolymer (EVA) at 60% of the weight of a rate 40% of the weight.

[0055]If this working example 3 and conventional example 3 are compared, the tearing strength (N) which shows the load required when tearing a string-like sample right and left has tear property with as sufficient tearing strength of the conventional example 3 as 55N.

Tearing strength lowers 53N and tearing strength low, the desired value "less than 70N" of the tearing strength which is a numerical value which can be torn comparatively simply is both attained, and working example 3 is also raising tear property.

Hardness has the pliability (hardness 90) of the PVC sheath average with as general-purpose hardness of the conventional example 3 as A88.

Working example 3 also has the pliability (hardness 90) of the PVC sheath average with as general-purpose hardness as A87.

Thus, although working example 3 and the conventional example 3 are what satisfies a desired value about tearing strength and hardness, About tensile strength, although the tensile strength of working example 3 has satisfied 11MPa and "10 MPa or more" which is a desired

value of tensile strength, it has resulted in the tensile strength of the conventional example 3 being less than 8MPa and "10 MPa or more" which is a desired value of tensile strength, and lacking in the tensile strength to need.

[0056]Therefore, putting together, the conventional example 3 has brought a result which cannot attain a desired value in respect of tensile strength, although it is satisfied about tear property and the pliability of the general-purpose PVC sheath average.

Evaluation is "x."

On the other hand, working example 3 is provided with sufficient tensile strength, its tear property is good, it results in having the pliability of a general-purpose PVC sheath EQC, has brought a result which can fully attain an aim at two points, tearing strength and hardness, and has become "O" as evaluation. If tear property is raised, the pliability of the general-purpose PVC sheath average is given and accumulated and an ethylene-vinyl acetate copolymer (EVA) is used for base resin so that clearly from the test result of this conventional example 3, can acquire tear property and pliability, but. Tensile strength falls, it may stop having the tensile strength as an electric wire sheath, and becoming less suitable as an electric wire sheath material understands. On the other hand, by working example's 3 blending straight-chain-shape low density polyethylene (LLDPE), in order to give predetermined tensile strength, and making base resin foam shows that tear property is raised and the pliability of the general-purpose PVC sheath average can be given.

[0057]When working example 4 is compared with the conventional example 4, working example 4, As opposed to base resin 100 weight section which mixed the ethylene-ethyl acrylate copolymer (EEA) for straight-chain-shape low density polyethylene (LLDPE) at 50% of the weight of a rate 50% of the weight, Foaming agent NO1 [0.5-weight section] (AZOJI carvone amide) is blended with what blended 80 weight sections of aluminium hydroxide, and it is made to foam to 9% of expansion ratio. The conventional example 4 straight-chain-shape low density polyethylene (LLDPE) 50 % of the weight, 80 weight sections of aluminium hydroxide is blended to base resin 100 weight section which mixed the ethylene-ethyl acrylate copolymer (EEA) 20% of the weight, and mixed ethylene propylene rubber (EPM) at 30% of the weight of a rate.

[0058]If this working example 4 and conventional example 4 are compared, the tearing strength (N) which shows the load required when tearing a string-like sample right and left has tear property with as sufficient tearing strength of the conventional example 3 as 60N. Tearing strength lowers 48N and tearing strength low, the desired value "less than 70N" of the tearing strength which is a numerical value which can be torn comparatively simply is both attained, and working example 3 is also raising tear property.

The hardness of hardness of the conventional example 4 is harder than the pliability (hardness 90) of A94 and the general-purpose PVC sheath average, and the hardness of working

example 4 has the pliability (hardness 90) of A89 and the general-purpose PVC sheath average. Thus, although tear property is good by leaps and bounds, hardness is high and, in tensile strength, 7MPa and brittleness have come out of the conventional example 4. On the other hand, working example 4 has good tear property by leaps and bounds, and hardness has also satisfied the desired value "less than A90."

It turns out that tensile strength does not have 15MPa and brittleness, either.

Therefore, the conventional example 4 has brought a result which cannot attain a desired value in respect of hardness and tensile strength putting together.

Evaluation is "x."

On the other hand, working example 4 is provided with sufficient tensile strength, its tear property is good, it has resulted in having the pliability of a general-purpose PVC sheath EQC, and has become "O" as evaluation. It turns out that it is what is depended on that working example 4 obtains predetermined tensile strength, obtains target hardness, and improves tear property in spite of having blended an equivalent amount of homogeneous **** agents so that clearly from the test result of this conventional example 4 and working example 4 making base resin foam. It is because ethylene propylene rubber (EPM) was blended that the conventional example 4 has improved tear property, and it is considered to have become weak in exchange for improvement in this tear property (fall of tensile strength).

[0059]As opposed to base resin 100 weight section with which working example 5 and the conventional example 5 mixed the ethylene-ethyl acrylate copolymer (EEA) 90% of the weight, and both mixed polypropylene (PP) at 10% of the weight of a rate, It is what blended 50 weight sections of magnesium hydroxide, and working example 5 blends foaming agent NO1 [five-weight section] (AZOJI carvone amide) with olefin system resin containing magnesium hydroxide, and 18% of expansion ratio is made, as for the conventional example 5, to foam in it to remaining as it is. If this working example 5 and conventional example 5 are compared, as for tensile strength, the tensile strength of working example 5 will have attained 11MPa and "10 MPa or more" whose ***** 5 which falls rather than the conventional example 5 and conventional examples 5 are the desired values of tensile strength to the tensile strength of the conventional example 5 being 18MPa. The tearing strength (N) which shows the load required when tearing a string-like sample right and left, The tearing strength of working example 5 exceeds greatly the desired value "less than 70N" of the tearing strength which is 44N and a numerical value which can be torn comparatively simply to the thing whose 153N and tear property of the tearing strength of the conventional example 5 are bad, and tear property is raised. As for hardness, the hardness of working example 5 has the pliability (hardness 90) of A85 and the general-purpose PVC sheath average to not having the pliability of the PVC sheath average with as general-purpose hardness of the conventional example 5 as A96. Putting together above, the conventional example 5 has bad tear property, brings the result

that it is harder than a general-purpose PVC sheath, and has brought a result which cannot attain a desired value in [two] that tearing strength is satisfied (***** and hardness). Evaluation is "x."

On the other hand, working example 5 is provided with sufficient tensile strength, its tear property is good, it results in having the pliability of a general-purpose PVC sheath EQC, in addition to tensile strength, has brought a result which can fully attain an aim at two points, tearing strength and hardness, and has become "O" as evaluation. In spite of having blended tales doses of homogeneous **** agents with tales doses of homogeneous olefine resin so that clearly from comparison of the composition component of working example 5 and the conventional example 5, It turns out that it is what is depended on that working example 5 was able to secure predetermined hardness and improvement in tear property was able to be aimed at having made olefin system resin containing magnesium hydroxide foam.

[0060]As opposed to base resin 100 weight section with which both working example 6 and the conventional example 6 mixed metallocene system straight-chain-shape low density polyethylene (metallocene system LLPDE) for the ethylene-vinyl acetate copolymer (EVA) at 60% of the weight of a rate 40% of the weight, Blend 120 weight sections of magnesium hydroxide, and a silane coupling agent (vinyltrimetoxysilane) The amount part of duplexs, It is what blended 0.1 weight sections for the JIKUMIRUPAOKI site (DCP), blended 0.1 weight sections and one weight section of poly methyl methacrylate (PMMA) for the catalyst (dibutyltin dilaurate), and constructed the bridge, The conventional example 6 blends foaming agent NO1 [0.2-weight section] (AZOJI carvone amide) with olefin system resin containing magnesium hydroxide, and makes working example 6 foam to 6% of expansion ratio to remaining as it is. If this working example 6 and conventional example 6 are compared, as for tensile strength, the tensile strength of working example 6 will have attained 11MPa and "10 MPa or more" whose ***** 6 which falls rather than the conventional example 6 and conventional examples 6 are the desired values of tensile strength to the tensile strength of the conventional example 6 being 13MPa. The tearing strength (N) which shows the load required when tearing a string-like sample right and left, The tearing strength of working example 6 exceeds greatly the desired value "less than 70N" of the tearing strength which is 55N and a numerical value which can be torn comparatively simply to the thing whose 98N and tear property of the tearing strength of the conventional example 6 are bad, and tear property is raised. As for hardness, the hardness of working example 6 has the pliability (hardness 90) of A87 and the general-purpose PVC sheath average to not having the pliability of the PVC sheath average with as general-purpose hardness of the conventional example 6 as A93. Putting together above, the conventional example 6 has bad tear property, brings the result that it is harder than a general-purpose PVC sheath, and has brought a result which cannot attain a desired value in [two] that tearing strength is satisfied (***** and hardness).

Evaluation is "x."

On the other hand, working example 6 is provided with sufficient tensile strength, its tear property is good, it results in having the pliability of a general-purpose PVC sheath EQC, in addition to tensile strength, has brought a result which can fully attain an aim at two points, tearing strength and hardness, and has become "O" as evaluation. In spite of having blended tales doses of homogeneous **** agents with tales doses of homogeneous olefine resin so that clearly from comparison of the composition component of working example 6 and the conventional example 6, It turns out that it is what is depended on that working example 6 was able to secure predetermined hardness and improvement in tear property was able to be aimed at having made olefin system resin containing magnesium hydroxide foam.

[0061]Although tales doses of homogeneous **** agents are blended with tales doses of olefine resin with homogeneous conventional example 3 and conventional example 6, 98N of the conventional example 6 and hardness are different [tensile strength] from the six conventional exampleA93 for 13MPa of the conventional example 6, and tearing strength to the three conventional exampleA88 to 55N of the conventional example 3 to 8MPa of the conventional example 3. This is understood to be what is depended on the bridge being constructed over base resin of the conventional example 6 as compared with a bridge not being constructed over base resin of the conventional example 3. If a bridge is generally constructed in base resin, the tensile strength of the base resin and hardness will increase.

[0062]Both working example 7 and the conventional example 7 receive 100 weight sections in an ethylene-ethyl acrylate copolymer (EEA), Blend 200 weight sections of magnesium hydroxide, and a silane coupling agent (vinyltrimetoxysilane) Three weight sections, It is what blended 0.2 weight sections for the JIKUMIRUPAOKI site (DCP), blended 0.2 weight sections and five weight sections of poly methyl methacrylate (PMMA) for the catalyst (dibutyltin dilaurate), and constructed the bridge, The conventional example 7 blends foaming agent NO1 (AZOJI carvone amide) and foaming agent NO2 [0.1-weight section] (azobisisobutyronitrile) with each olefin system resin containing magnesium hydroxide, respectively, and working example 7 is made to foam to it to remaining as it is at 5% of expansion ratio. If this working example 7 and conventional example 7 are compared, as for tensile strength, the tensile strength of working example 7 will have attained 11MPa and "10 MPa or more" whose ***** 7 which falls a little rather than the conventional example 7 and conventional examples 7 are the desired values of tensile strength to the tensile strength of the conventional example 7 being 12MPa. The tearing strength (N) which shows the load required when tearing a string-like sample right and left, The tearing strength of working example 7 exceeds greatly the desired value "less than 70N" of the tearing strength which is 56N and a numerical value which can be torn comparatively simply to the thing whose 93N and tear property of the tearing strength of the conventional example 7 are bad, and tear property is raised. As for hardness,

the hardness of working example 7 has the pliability (hardness 90) of A89 and the general-purpose PVC sheath average to not having the pliability of the PVC sheath average with as general-purpose hardness of the conventional example 7 as A99. Putting together above, the conventional example 7 has bad tear property, brings the result that it is harder than a general-purpose PVC sheath, and has brought a result which cannot attain a desired value in [two] that tearing strength is satisfied (***** and hardness).

Evaluation is "x."

On the other hand, working example 7 is provided with sufficient tensile strength, its tear property is good, it results in having the pliability of a general-purpose PVC sheath EQC, in addition to tensile strength, has brought a result which can fully attain an aim at two points, tearing strength and hardness, and has become "O" as evaluation. In spite of having blended tales doses of homogeneous **** agents with tales doses of homogeneous olefine resin so that clearly from comparison of the composition component of working example 7 and the conventional example 7, It turns out that it is what is depended on that working example 7 was able to secure predetermined hardness and improvement in tear property was able to be aimed at having made olefin system resin containing magnesium hydroxide foam.

[0063]

[Effect of the Invention] Since this invention is constituted as explained above, it does so an effect which is indicated below.

[0064] According to the invention according to claim 1, the olefin system resin which does not contain a halogenide can be used as the main ingredients, tear load and crookedness load can be controlled, predetermined tear load and predetermined crookedness load can be given, tear nature can be improved, and handling nature and workability can be raised.

[0065] According to the invention according to claim 2, the olefin system resin which does not contain a halogenide can be used as the main ingredients, tear load and crookedness load can be controlled, predetermined tear load and predetermined crookedness load can be given, tear nature can be improved, and handling nature and workability can be raised.

[0066] According to the invention according to claim 3, the olefin system resin which does not contain a halogenide is used as the main ingredients, Tear load and crookedness load are controlled, predetermined tear load and predetermined crookedness load are given, tear nature can be improved, handling nature and workability can be raised, and the fire retardancy made into a standard can be secured.

[0067] According to the invention according to claim 4, the olefin system resin which does not contain a halogenide is used as the main ingredients, Tear load and crookedness load are controlled, predetermined tear load and predetermined crookedness load are given, tear nature can be improved, handling nature and workability can be raised, and the fire retardancy made into a standard can be secured.

[0068]According to the invention according to claim 5, the olefin system resin which does not contain a halogenide is used as the main ingredients, Tear load and crookedness load are controlled, predetermined tear load and predetermined crookedness load are given, tear nature can be improved, handling nature and workability can be raised, and the fire retardancy made into a standard can be secured.

[0069]According to the invention according to claim 6, the olefin system resin which does not contain a halogenide is used as the main ingredients, Tear load and crookedness load are controlled, predetermined tear load and predetermined crookedness load are given, tear nature can be improved, handling nature and workability can be raised, and the fire retardancy made into a standard can be secured.

[0070]According to the invention according to claim 7, the foaming time of olefin system resin which is base resin of a non halogen fire retardancy sheath can be freely adjusted by choosing the Organic Chemistry Division foaming agent blended with a non halogen fire retardancy sheath.

[0071]Since the masterbatch of specific expansion ratio (for example, 10%) is made beforehand according to the invention according to claim 8, even if it is a product in which expansion ratio differs, by using this masterbatch. It can tear freely by controlling the addition of a masterbatch, and a sex can be adjusted, by the change in the addition of a masterbatch, foaming efficiency can be changed freely, a constant level can tear, a sex and pliability can be acquired, tear nature can be improved, and handling nature and workability can be raised.

[0072]According to the invention according to claim 9, the olefin system resin which does not contain a halogenide is used as the main ingredients, Tear load and crookedness load are controlled, predetermined tear load and predetermined crookedness load are given, tear nature can be improved, handling nature and workability can be raised, and the fire retardancy made into a standard can be secured.

[0073]According to the invention according to claim 10, the olefin system resin which does not contain a halogenide is used as the main ingredients, Tear load and crookedness load are controlled, predetermined tear load and predetermined crookedness load are given, tear nature can be improved, handling nature and workability can be raised, and the fire retardancy made into a standard can be secured.

[0074]According to the invention according to claim 11, the olefin system resin which does not contain a halogenide is used as the main ingredients, Tear load and crookedness load are controlled, predetermined tear load and predetermined crookedness load are given, tear nature can be improved, handling nature and workability can be raised, and the fire retardancy made into a standard can be secured.

[0075]According to the invention according to claim 12, the olefin system resin which does not contain a halogenide is used as the main ingredients, Tear load and crookedness load are

controlled, predetermined tear load and predetermined crookedness load are given, tear nature can be improved, handling nature and workability can be raised, and the fire retardancy made into a standard can be secured.

[0076]According to the invention according to claim 13, the olefin system resin which does not contain a halogenide is used as the main ingredients, Tear load and crookedness load are controlled, predetermined tear load and predetermined crookedness load are given, tear nature can be improved, handling nature and workability can be raised, and the fire retardancy made into a standard can be secured.

[0077]According to the invention according to claim 14, a non halogen fire retardancy sheath is easily processible.

[0078]According to the invention according to claim 15, a non halogen fire retardancy sheath can be prevented from deteriorating temporally.

[Translation done.]

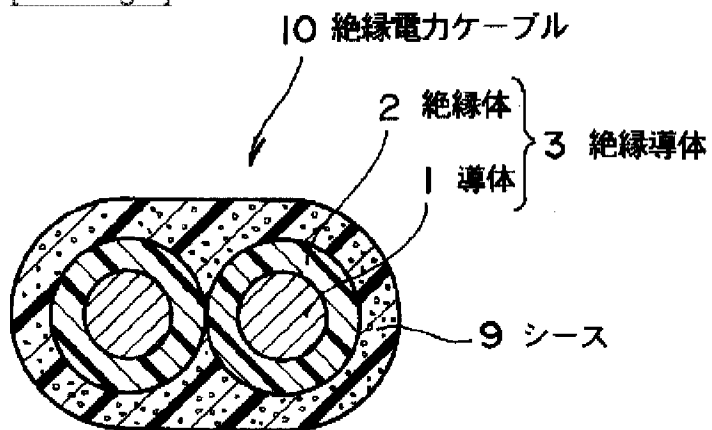
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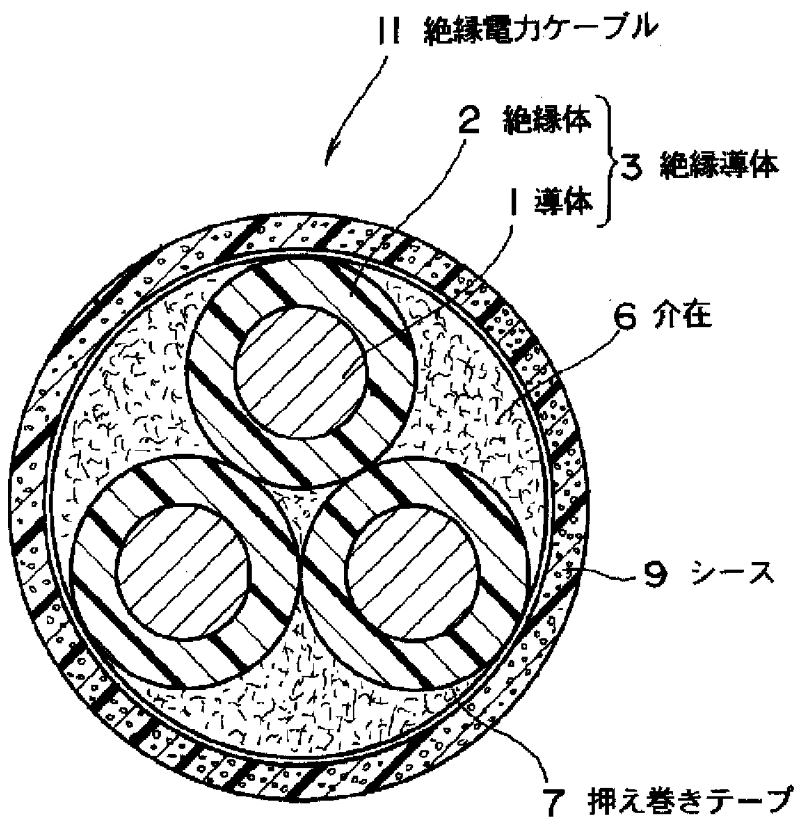
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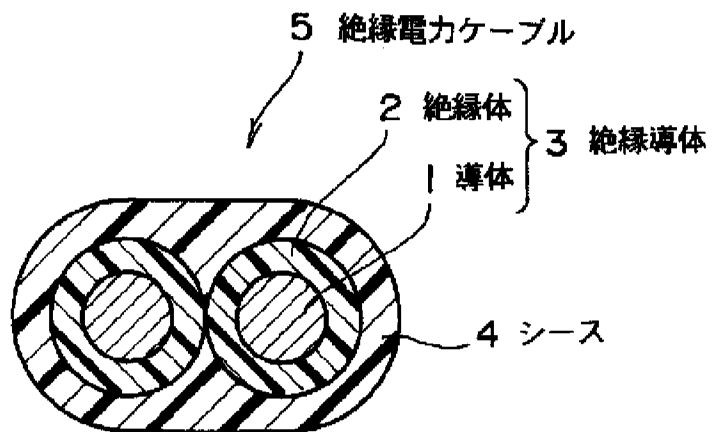
[Drawing 1]



[Drawing 2]



[Drawing 3]



[Drawing 4]

